UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SUZHOU MOJAWA INTELLIGENT ELECTRONIC CO., LTD.,
Petitioner,

v.

SHENZHEN SHOKZ CO., LTD.,
Patent Owner.

U.S. Patent No. 11,310,582

Case IPR2025-00843

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 11,310,582
1002	File History of U.S. Patent No. 11,310,582
1003	Expert Declaration of Dr. Chris Kyriakakis
1004	CN107454492A ("Li") [Certified English Translation]
1005	CN106937222A ("Liao") [Certified English Translation]
1006	CN202931524U ("Asaka") [Certified English Translation]
1007	JP2008294872A ("Numata") [Certified English Translation]
1008	CN205356672U ("Wang") [Certified English Translation]
1009	CN205017577U ("Xu") [Certified English Translation]
1010	WO 2009/086838 ("Nielsen")
1011	US 2008/0279409 ("Hupkes")
1012	US 7,672,469 ("Dryer")
1013	US 8,515,103 ("Mei")
1014	US 2016/0080853 ("Chen")
1015	US 9,866,966 ("Lott")
1016	US 2018/0316999 ("Bellas")
1017	US 5,987,147 ("Nishimoto")
1018	JP2007189269A ("Nakada") [Certified English Translation]
1019	US 2014/0126742 ("Eggebraaten")

Exhibit	Description
1020	US 8,223,997 ("Wilson, II")
1021	US 8,111,860 ("Retchin")
1022	CN107454492A ("Li") [Original]
1023	CN106937222A ("Liao") [Original]
1024	CN202931524U ("Asaka") [Original]
1025	JP2008294872A ("Numata") [Original]
1026	CN205356672U ("Wang") [Original]
1027	CN205017577U ("Xu") [Original]
1028	JP2007189269A ("Nakada") [Original]
1029	Declaration of Benjamin Mueller
1030	Excerpts of February 28, 2025 Mojawa's Objections and Responses to Shokz's First Set of Interrogatories
1031	U.S. Patent No. 11,197,084 ("'084 patent")
1032	U.S. Patent No. 10,306,351 ("Kim")
1033	Excerpt of File History of '084 patent
1034	*Shenzhen Shokz Co., Ltd. v. Shenzhen Wenming Technology Co., Ltd. et al.*, Case No. 1-24-cv-06717 (N.D. Ill.), June 12, 2025 Motion by Mojawa to Stay Pending Resolution of IPR
1035	*Shenzhen Shokz Co., Ltd. v. Shenzhen Wenming Technology Co., Ltd. et al.*, Case No. 1-24-cv-06717 (N.D. Ill.), July 11, 2025
1036	Northern District of Illinois Judicial Caseload Profile, https://www.uscourts.gov/sites/default/files/document/fcms_na_distprofile0630.2025.pdf

Exhibit	Description
1037	Docket Navigator Judge Jorge L. Alonso Profile
1038	*Shenzhen Shokz Co., Ltd. v. Shenzhen Wenming Technology Co., Ltd. et al.*, Case No. 1-24-cv-06717 (N.D. Ill.), District Court case docket (accessed August 31, 2025)
1039	RESERVED
1040	RESERVED
1041	Rebuttal Expert Declaration of Dr. Chris Kyriakakis

I. INTRODUCTION

The Petition establishes that the Challenged Claims are unpatentable based on the combinations set forth in instituted Grounds 1-4. The principal prior art references are owned by Patent Owner. The Challenged Claims include features that constitute nothing more than routine engineering changes from its own prior patents, not invention.

The Board found Petitioner is likely to prevail. Institution Decision (Paper 15) ("ID") 64-65. Patent Owner's Response (Paper 25, "POR") repeats arguments already rejected by the Board, and nothing therein disturbs the conclusion that the Challenged Claims are unpatentable.

II. CLAIM CONSTRUCTION

Patent Owner's Response acknowledges claim 5's typographical error but otherwise advances a "plain and ordinary" construction. POR 10. The Board need not construe any term to conclude that the subject matter of the Challenged Claims is unpatentable. *See Realtime Data LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe only those terms that are in controversy, and only to the extent necessary to resolve the controversy.") (citation omitted).

A. "elastically abutted against" (Element 1[c])

Patent Owner's proposed "plain and ordinary" construction of the phrase "*the core housing being … elastically abutted against the protective sleeve*"

(Element 1[c]) attempts to package its disagreement with the Board's factual analysis in the Institution Decision as a legal question. *See* POR 10. The Board need not construe this phrase because the Li-Liao combination teaches Element 1[c] even under Patent Owner's construction, and, therefore, construction is not necessary to resolve the controversy.

Moreover, Patent Owner's construction adds words that are not present in the claim. The claims do not specify that "an end surface of the core housing [is] in contact with the protective sleeve under an elastic force" as proposed by Patent Owner, POR 14-15, but rather that "the core housing" is elastically abutted against the protective sleeve.

Patent Owner's proposed construction is inconsistent with the patent specification. The specification discloses the protective sleeve is in elastic abutment against the core housing in locations other than an "end surface." EX1001, 13:46-50 (annular boss 162 of protective sleeve 16 elastically abuts connecting slope 24 of core housing 20; 13:34-45; FIG. 6 (connecting slope 24 is setback from end surface 21 such that the connecting slope 24 "[connects] the outer end surface 21 of the core housing 20 and the inner sidewall of the socket 22," and is "not on the same plane" as the outer end surface 21), 12:16-26(outer sidewall of one component is "abut[ted] against" inner sidewall of another component). Patent Owner's reliance upon extrinsic evidence, POR 11-12

(reliance on dictionary definition of "abut"), does not warrant a departure from the claim language and specification. *See, e.g.*, *Grace Instrument Indus., LLC v. Chandler Instruments Co.*, LLC, 57 F.4th 1001, 1008, 1010 (Fed. Cir. 2023).

Patent Owner's suggestion that "elastically abutting" requires a waterproof relationship, POR 14, ignores the doctrine of claim differentiation. *See, e.g., Clearstream Wastewater Sys., Inc. v. Hydro-Action, Inc.*, 206 F.3d 1440, 1446-47 (Fed. Cir. 2000); *Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 971-72 (Fed. Cir. 1999). Claim 10, which depends from claim 1, recites "when the core housing and the first plug end are fixed, the protective sleeve elastically abuts against the core housing to realize sealing." EX1001, 37:40-46 (claim 10). Construing "elastically abutting" by itself to mean a waterproof seal would render the added language in claim 10 "superfluous." *Beachcombers v. WildeWood Creative Prods., Inc.*, 31 F.3d 1154, 1162 (Fed. Cir. 1994).

Petitioner has shown Element 1[e] would have been obvious under Patent Owner's proposed construction of Element 1[c]. Accordingly, the Board should follow its reasoning in the Institution Decision and decline to provide a specific construction of this phrase.

B. "the control circuit or the battery driving the earphone core to vibrate" (Element 1[f])

Patent Owner does not contest Li discloses Element 1[f] but instead belatedly seeks dismissal of the IPR, arguing Petitioner's claim construction in the IPR contradicts its proposed construction in the district court. POR 78-80. The Director has already rejected Patent Owner's discretionary denial challenge. Paper 8 (Discretionary Denial Brief); Paper 14, 2-3 (Director's Decision referring petition to panel for "merits and other non-discretionary considerations"). The Board should decline Patent Owner's request to revisit such issue. *See Savant Techs. LLC v. FEIT Electric Co., Inc.*, IPR2024-01357, Paper 69 at 8-10 (PTAB April 9, 2026) (authority to grant discretionary relief resides exclusively with Director).

On the merits, Patent Owner's contradictory claim construction argument is incorrect. Petitioner argued in both the district court litigation and the Petition that Element 1[f] should be given its plain and ordinary meaning. *Compare* EX2023, 17-20 ("or" should be given its "plain meaning") *with* Petition ("Pet.") 6-7 (claim terms other than claim 5 "should be construed according to their plain and ordinary meaning"). In the district court litigation, Petitioner sought a construction of Element 1[f] as being "either the control circuit or the battery, but not both, driving the earphone core to vibrate," EX2023, 17, to refute Patent Owner's construction

that would permit both the control circuit and battery together to drive the earphone core. *See id*., 19-20. There is no need to resolve this dispute here because, as Patent Owner concedes, Li discloses Element 1[f] under either construction. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Furthermore, Patent Owner erroneously relies upon an incomplete excerpt of Dr. Kyriakakis's (Petitioner's technical expert) testimony to support its "contradictory" construction argument. POR 78-79. But Dr. Kyriakakis's testimony confirms Petitioner faithfully applied a consistent construction of Element 1[f] by demonstrating Li discloses a control circuit drives the earphone core to vibrate to generate a sound. *See* Pet. 36-38, EX1003, ¶146; EX2021, 65:3-71:14.

Dr. Kyriakakis explained Li discloses the control circuit drives the earphone core, not the battery. *See, e.g.*, EX2021, 66:12-19 ("**Q** … In the Li reference, both the control circuit and the battery drive the earphone core to vibrate. Correct? …·**THE WITNESS**:· That's not what it says. It says the control circuit is used to control the earphone."), 67:4-10 ("**Q**· Okay.· So in order to produce any intended sound, the device in Li would require the control circuit to -- to drive the earphone core to vibrate.· Correct? **A**· Yes.· The control circuit is delivering the intended audio signals to the transducer that vibrates."), *see also* 69:14-70:7; 70:9-71:14.

Despite Patent Owner's repeated attempts to obtain different testimony, Dr. Kyriakakis testified that Li discloses only the control circuit drives the earphone core, and the battery is used to power the components. EX2021, 68:22-69:6, 70:9-71:14.

Dr. Kyriakakis testified Element 1[f] does not exclude *the presence* of both components:

> **Q**· · Would you -- when you say "one or the other," does that mean -- just mean it can be at least one of the two? …
>
> **THE WITNESS**:· Yes.
>
> …
>
> **Q**· · Okay.· And it doesn't exclude both? …
>
> **THE WITNESS**:· You mean can they both be there?
>
> …
>
> **Q**· · Correct.
>
> **A**· · Is it -- it doesn't exclude it, but it doesn't require it.
>
> **Q**· · ***And -- and Li has both.· Right?***
>
> **A**· · ***In that excerpt, Li is saying that it's powered by battery, but he's not saying that the battery is driving anything acoustic***.

EX2021, 70:22-71:14 (emphasis added). This is consistent with the claim construction advanced by Petitioner in the district court.

Patent Owner's request to dismiss the Petition should be rejected because, unlike in *Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632,

Paper 20 (Director Nov. 3, 2025) (precedential), Petitioner did not adopt Patent Owner's proposed claim construction of Element 1[f] or apply a broader construction in the IPR. Rather, Petitioner applied the same construction in both forums. *Tesla, Inc. v. Intellectual Ventures II LLC*, IPR2025-00340, Paper 18 (Director Nov. 5, 2025) (informative), likewise counsels against Patent Owner's request. There, the petitioner proposed a "plain and ordinary meaning" for a term it had argued was indefinite during litigation. *Id*., 2. The Director pointed out that "Petitioner's explanation may have risen to a sufficient level, for example, if Petitioner had shown that, notwithstanding the alleged indefiniteness of the claim term, an ordinarily skilled artisan would understand that the asserted art satisfies the claim limitation." *Id*., 3-4. That is the situation here, where Patent Owner does not challenge Li discloses Element 1[f] under either construction.

III. GROUND 1: THE COMBINATION OF LI AND LIAO RENDERS CLAIMS 1 AND 14 OBVIOUS

A. Claim 1: An Ear Hook with First and Second Plug Ends (Element 1[a]) Would Have Been Obvious

1. Li Does Not Teach Away from an Ear Hook with First and Second Plug Ends

Patent Owner repeats its argument that Li teaches away from adding a plug at each end of connecting component 113. See POR 18-26; Patent Owner's Preliminary Response ("POPR") 39-41; ID 45-46. However, "'a reference does not teach away'" by expressing "'a general preference for an alternative invention

but does not 'criticize, discredit, or otherwise discourage' investigation into the invention claimed.'" *See* ID 45-46 (quoting *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009). Nothing in the POR should disturb the Board's finding that Li does not "'criticize, discredit, or otherwise discourage'" using a plug to connect a housing to connecting component 113. *See* ID 46.

(a) Structural Stability and Integrity Concerns Do Not Negate Obviousness

Adding plug ends to the Li ear hook would not be "in contradiction to" or "incompatible with" Li's disclosure as Patent Owner argues. POR 18-20, 23-26; EX1041 (Kyriakakis Rebuttal Decl.), ¶¶5-6. Li merely "expresses a general preference for connecting first housing 111 and second housing 112 to the two ends of first elastic metal wire 1131 in connecting component 113 by injection molding." ID 46. "Li discloses a variety of ways to connect components in a bone conduction earphone but does not appear to 'criticize, discredit, or otherwise discourage' any of those ways." ID 46 (citing*, e.g.*, Ex. 1004, ¶¶ 29, 35, 44–45, 58–59, Figs. 2, 9; Ex. 1003, ¶¶ 57, 117, 121).

Patent Owner wrongly argues "[i]nterchangeability is inconsistent with Li's adhesive-based or locked plug connections." POR 23-26, 25. Li discloses adhesive application and locking pieces are "optional[]." EX1004, ¶60. Thus,

these optional features would not render Li incompatible with modular construction. EX2021 at 79:2-18; EX1041, ¶6. Li discloses its plug end connection does permit interchangeability. EX1004, ¶59 (plug in portion 123 facilitates later wiring). Furthermore, Li discloses the locked plug connection can be made with reversible or removable structure such as a wedge or pin. EX1004, ¶61. As such, a locked plug connection is also not incompatible with interchangeability. EX1041, ¶6. In addition, "interchangeability" is but one reason among several (e.g., simplified manufacturing and reduced costs) for adopting the modular construction achieved with first and second pug ends. *See* Pet. 23-28, 24-25.

(b) Waterproofing Concerns Do Not Obviate Motivation to Include Plug Ends

Patent Owner raises "waterproofing concerns" to argue against the obviousness of modifying Li to include plug ends. But such an argument overlooks a "given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed Cir. 2006). "[T]he benefits, both lost and gained, should be weighed against one another." *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000). Furthermore, Petitioner does not need to show "that a combination is 'the *best*

option, only that it be a *suitable* option.'" *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (emphases by the court) (quoting *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014)).

Here, Patent Owner argues against the very modification it made in transitioning from the arrangement in Li to that claimed in the '582 patent. Its own actions belie the severity of the "waterproofing concerns." POR 21. That water could enter the device through additional points did not deter Patent Owner from adopting the claimed arrangement. *See* Pet. 27-28; EX1001, 11:66-12:11, 16:29-40; EX 1003, ¶119. Nor would it have deterred a POSITA, who would have been very familiar with waterproofing techniques, including using elastomeric sealing material between adjoining components. EX1041, ¶7. A POSITA would have been motivated to modify Li's ear hook to include first and second plug ends to achieve the benefits of modularity, including those Li disclosed, namely "simplifying the structure, … facilitating later wiring, and reducing costs," EX1004, ¶59, notwithstanding risk of water infiltration. EX1041, ¶7. Patent Owner's own actions confirm the benefits of modularity outweigh any purported drawbacks.

2. A POSITA Would Have Been Motivated to Modify Li to Include First and Second Plug Ends

Patent Owner criticizes the modular references, POR 26-36, but fails to address "whether a skilled artisan would have been motivated to combine Li's teachings with the skilled artisan's knowledge about the benefits of modular component design." ID 49 (citing *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337–38 (Fed. Cir. 2020)). Nor does Patent Owner undermine the determination that the Petition identifies a reason with rational underpinning to modify Li to add a plug at each end of connecting component 113, i.e., to obtain the well-known benefits of modular component design. ID 47.

A POSITA's knowledge may be relied upon to establish obviousness. *See* ID 47-48 (citing *Philips*, 948 F.3d at 1337–38; *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1365 (Fed. Cir. 2015)); *see also Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (POSITA's knowledge is "'part of the store of public knowledge that must be consulted"). Here, a POSITA's knowledge regarding modular construction provided a "reason to combine the known elements in the fashion claimed." *See KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 418 (2007); *see also Randall*, 733 F.3d at 1356, 1362 ("well-documented knowledge" explained POSITA's motivation).

The choice to locate the modular connections at the ends of the ear hook is not "arbitrary." POR 18-19. A POSITA would have understood there to be finite places to locate modular connections in a loudspeaker apparatus to best achieve the benefits of modular construction, among which are the ends of the ear hook. EX1041, ¶¶8-9.

In a bone-conduction earphone, the ear hook mechanically supports the core housing (containing the speaker) and the circuit housing (containing the battery or control circuit). These two junctions are natural points for modular separation because they are where the ear hook interfaces with the functional modules. EX1041, ¶9. A POSITA, seeking the well-known benefits of modular design (e.g., simplified manufacturing, component replacement, cost reduction), would have recognized that adding plug ends at these two interfaces is an obvious and predictable solution, not an inventive leap. Petition 23-28; EX1003, ¶121; EX2021, 63:1-12; EX1041, ¶9; *KSR*, 550 U.S. at 421; *see also CyWee Grp. Ltd. v. ZTE (USA), Inc.*, 90 F.4th 1358, 1363, 1366 (Fed. Cir. 2024) (Board's obviousness finding supported by testimony that prior art combination involved merely "routine engineering tasks").

Patent Owner's argument that the Petition's reference to modular prior art contravenes 37 C.F.R. § 42.104(b)(4) and the reasoning in the July 31, 2025 Director Memo (POR 33-36) misses the mark. The Board has already determined

Petitioner complied with Rule 42.104(b)(4) . ID 63-64. The modular prior art cited in the Petition are prior art patents and, therefore, fall outside of the definition of "general knowledge" in the Memo. *See* July 31, 2025 Director Memo 1. The Petition is consistent with the Director's Memo because it uses the modular prior art and expert testimony to demonstrate knowledge of a POSITA and to support a motivation to combine. *See id*.; ID 47-50.

3. No Secondary Considerations of Nonobviousness

Patent Owner provided no evidence of secondary considerations of nonobviousness, much less any such evidence directed to ear hook plug ends. Patent Owner's hindsight argument, *see* POR 20, is undercut by the absence of such evidence. *See* ID 33 (citing *Cheese Sys., Inc. v. Tetra Pak Cheese & Powder Sys., Inc*., 725 F.3d 1341, 1352 (Fed. Cir. 2013)).

B. Claim 1: The Core Housing Being Elastically Abutted Against the Protective Sleeve Would Have Been Obvious (Element [1c])

Patent Owner incorrectly argues "there is nothing in Li to suggest that Li's elastic coating layer 122 is elastically compressed against the housing 111 ('***elastically*** abut')." POR 37. As the Board found, Li teaches a housing "elastically abutted against the protective sleeve." ID 54 (citing EX1003, ¶¶129-130; EX1004, ¶58, FIGS. 2, 3, 5, 9, 10; Pet. 30-33). "[T]he second elastic coating layer 122 is a silicone layer" and "can also be a rubber layer or a latex layer, or a

composite material layer including silicone," (EX1004, ¶58; *see* EX1003, ¶130), which serves as a protective waterproof covering. *See* EX1003, ¶125.

Li discloses the second elastic coating layer 122 abuts a housing when "plug-in portions 123 are respectively connected and fixed to the first housings 111 of the two ear hook assemblies 11." ID 55 (citing EX1004, ¶58, Figs. 2, 3, 5, 9, 10). For example, "Li's Figure 10 (reproduced below) shows second elastic coating layer 122 with end portions extending over each plug-in portion 123 and abutting first housing 111 or third housing 114 (or both) when plug-in hole 1111 in first housing 111 receives plug-in portion 123." ID 55; EX1004, FIG. 10.

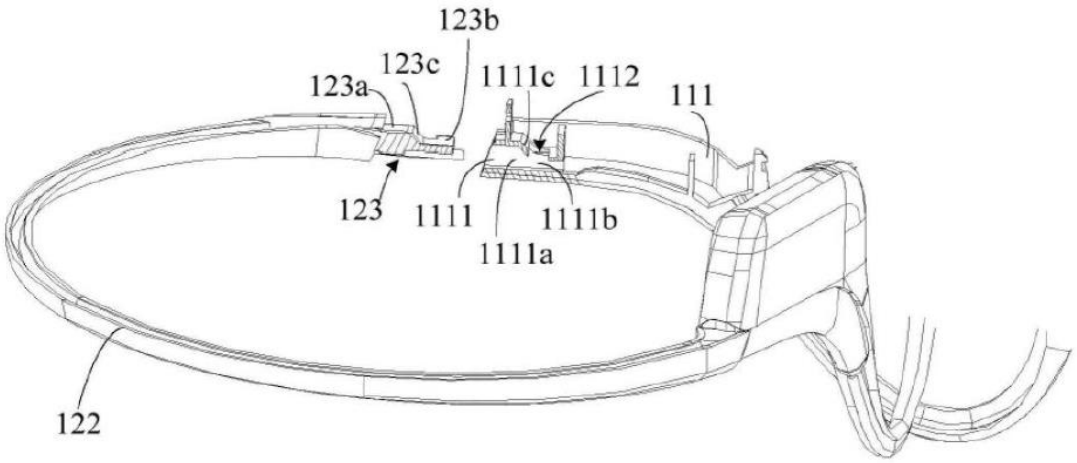


Figure 10

EX1004, FIG. 10

A POSITA would have understood the second elastic coating layer 122 elastically deforms when it abuts the housing. EX1041, ¶¶10-13. Li discloses the plug-in portion 123 and the plug-in hole 1111 are configured for a "tight fit"

between them so that "the rear hook can be effectively connected to the ear hook. EX1004, ¶¶62-64. Li discloses the plug-in portion 123 fully occupies the plug-in hole 1111 when inserted. EX1004, FIG. 10 (annotated below); EX1041, ¶12.

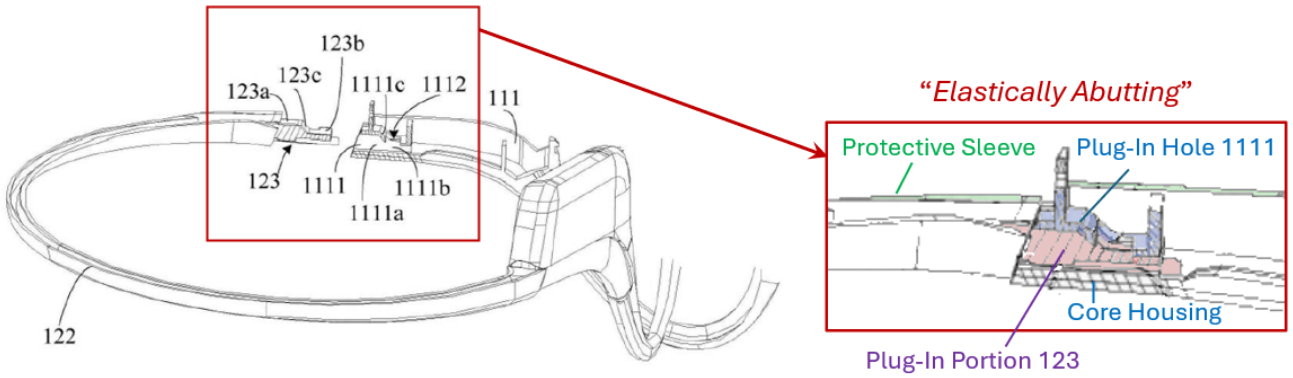


Figure 10

EX1004, FIG. 10 (annotated)

A POSITA would have understood that the second elastic coating layer 122 compresses against the end of the plug-in hole 1111 of the housing 111 to effect the tight fit therebetween and to account for ordinary engineering tolerances. EX1041, ¶12. Patent Owner asks the Board to disregard what Li's figures disclose (POR 39), but in doing so ignores that "[a] reference may be read for all that it teaches." *In re Mouttet*, 686 F.3d 1322, 1331 (Fed. Cir. 2012).

The compression of the second elastic coating layer 122 in the Li-Liao combination follows the same elastically abutting relationship described in the '582 patent, namely that the protective sleeve is elastically compressed. EX1041, ¶13. The '582 patent describes the annular abutting surface 161 and the annular

boss 162 of the protective sleeve 16 being in interfering relationship with the core housing 20 such that the protective sleeve 16 is elastically compressed when it is abutted against the core housing. EX1001, 13:18-33, 13:46-50, FIG. 6. Accordingly, a POSITA would have found it obvious for the protective sleeve to undergo elastic deformation by being compressed against the core housing—in the same manner as described in the '582 patent—in view of the Li-Liao combination. EX1041, ¶13.

Patent Owner misrepresents the Petition's modification of the Li ear hook when it argues "once the connecting component 113 is segmented to accommodate the plug ends, any purported abutting—elastic or otherwise—would be between the ends of the elastic coating layer, and not against the core housing." POR 42-45, 43. As the Petition explains, Li teaches a housing (third housing 114) elastically abutted against the protective sleeve (second elastic coating layer 122), and it would have been obvious to replicate the same plug-in portion 123 design at the first plug in location (Element 1[a])—which would "yield the core housing (Li's second and fourth housing 112, 115) being fixed to the first plug end *and elastically abutted against the protective sleeve* over Li's connecting component 113 (*ear hook*)." Pet. 32 (emphasis in original) (citing EX1003, ¶130).

C. Claim 1: It Would Have Been Obvious for Housing Panels to Vibrate at the Claimed Frequencies (Element [1e])

Patent Owner again improperly attempts to apply the "necessarily present" standard for inherent anticipation, POR 46-49, but Petitioner's challenge is based on express disclosure in Liao and obviousness in the combination of Li and Liao, not anticipation. For obviousness, Petitioner need not show Liao's housing construction *necessarily* always produces the claimed phase difference as Patent Owner argues. Rather, all that is required is that it would have been obvious to a POSITA for Liao's housing to perform in the same way as the claimed housing, including *an absolute value of a difference between the first phase and the second phase is less than 60 degrees*. Pet. 34-36, EX1003, ¶¶134-144.

The Board has determined "the first sentence of Liao's paragraph 58 is sufficient to teach the disputed portion of limitation [1e]." ID 60-61. Liao discloses direct attachment between the housing panels. *Id.*, citing EX1005, ¶58. Furthermore, Liao discloses the housing is made of a rigid material including those identified in the '582 patent as housing panel materials, further adding to the POSITA's understanding that the Liao housing would vibrate similarly to the '582 patent's housing. *Compare* EX1005, ¶0075 *with* EX1001, 18:16-19:16 (each identifying ABS, PS, HIPS, PP, etc.); EX1003, ¶140.

Moreover, the specific geometry of Liao's direct-attachment housing further supports predictable in-phase vibration. Liao discloses a housing with a flat, planar front panel and a flat rear housing wall of substantially similar shape, with the vibration source located centrally. EX1041, ¶¶14-16. Liao does not teach a housing including curvatures, cutouts, or asymmetric reinforcements that would induce phase misalignment. A POSITA would have understood the housing to include front and back panels that vibrate with nearly identical phase and amplitude within the claimed frequency range. *Id*. Patent Owner's generalized concerns about geometry (POR 46-47) are not applicable to the Liao housing which lacks those features that might cause differential behavior, and do not negate Liao's teachings of a housing having panels that vibrate with a phase difference well below 60°. *Id*., ¶16.

Patent Owner's "hindsight bias" argument, POR 49-53, mischaracterizes Liao, which discloses a variety of connection methods and touts the benefits of the direct attachment method. EX1005, ¶¶57-58, 63 ("General technical personnel in this field can determine the material, position, and connection method of the connection member according to different practical applications, or modify, improve, or combine the properties of the different connection members mentioned above.… For example, the connection members described above may not be necessary. The panel can be directly mounted on the housing or bonded to the

housing with adhesive."). Liao does not "criticize, discredit, or otherwise discourage" using a direct attachment method, *see DePuy Spine*, 567 F.3d at 1327, and, indeed, recognizes that it is desirable. *See* EX1005, ¶63; EX1041, ¶17. Again, Patent Owner's hindsight argument is unsupported as it offers no evidence that the claimed frequencies have any nexus to secondary considerations of nonobviousness. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995) ("For objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.").

A POSITA would have understood that Liao's direct-attachment embodiment includes a housing with planar panels of uniform thickness and a centrally located vibration source. EX1041, ¶¶16, 18. In such a configuration, the vibration transmission path is direct and symmetrical, minimizing propagation delay. A POSITA would have understood that the front and back panels vibrate substantially in-phase, with a phase difference well below 60° in the 2000-3000 Hz range. EX1041, ¶18. Dr. Scordilis's hypothetical counterexamples (e.g., curved panels, asymmetric support) are not present in Liao's disclosure and do not undermine the predictability of the result for the specific structure taught. *Id*.

D. Claim 14: It Would Have Been Obvious for Housing Panels to Vibrate Within the Claimed Vibration Amplitude Ratio Range

Patent Owner's claim 14 arguments mirror its Element 1[e] arguments. *See* POR 53-60. They should be rejected for the same reasons.

Patent Owner again improperly conflates Petitioner's obviousness challenge and the law of inherency anticipation. Obviousness does not require Petitioner to establish a "guarantee" that the Liao panels vibrate at the same amplitude. POR 53-56. Petitioner need not show that Liao's housing construction *necessarily always* produces the claimed vibration amplitude ratio range. Rather, all that is required is that Liao discloses or suggests a housing that performs in the same way as the claimed housing, including panels that vibrate with an amplitude ratio in a range of 0.5 to 1.5. Pet. 40-42, EX1003, ¶¶136, 150-153; *DexCom, Inc. v. Stewart*, No. 2024-1291, 2025 WL 2399052, at *4 (Fed. Cir. Aug. 19, 2025) ("[T]he Board focused its inquiry on what [the prior art reference] would teach or suggest to a person of ordinary skill in the art, rather than limiting itself to what [the reference] literally says or shows. To do otherwise would have been error.").

A POSITA would have been motivated to construct a housing with a direct attachment technique such that "the housing panels would also have nearly the same amplitudes within a range of 0.5 to 1.5 due to the rigid construction of the core housing with rigid materials of the same thickness, and the amplitudes being

driven from the same source." EX1003, ¶153; Pet. 42. This testimony is consistent with the relationship between housing rigidity and amplitude described in the '582 patent itself. EX1001, 20:57-67 ("[W]hen the housing of the bone conduction speaker has a relatively large rigidity, the housing panel and the housing back panel may keep the same or substantially the same vibration amplitude and phase at higher frequencies."). The '582 patent itself fails to address the conditions Patent Owner now asserts affect amplitude (POR 54-56; EX2020, ¶¶132-134), which further undercuts Patent Owner's argument. EX1041, ¶19.

Patent Owner misleadingly asserts the panels of the speaker housing 210 in FIG. 2-B of Liao have different thicknesses. POR 56-59. However, the housing 210 of FIG. 2-B includes a connection member 240. EX1005, ¶55. Therefore, this argument is irrelevant to a housing construction using direct attachment, as discussed in the Petition. Pet. 41-42. Accordingly, the Liao housing discloses or suggests the claimed amplitude ratio range of claim 14. Pet. 40-42.

Finally, Patent Owner offers no evidence connecting the claimed amplitude ratio range to any secondary considerations of nonobviousness. Patent Owner's hindsight argument, *see* POR 20, is undercut by the absence of such evidence. *See* ID 33 (citing *Cheese Sys.*, 725 F.3d at 1352).

IV. GROUNDS 2–4 DEMONSTRATE THE CHALLENGED DEPENDENT CLAIMS ARE OBVIOUS

A. Ground 3: The Li-Liao-Numata Combination Renders Claims 7–12 Obvious

Patent Owner incorrectly argues the Li-Liao-Numata combination "results in a permanently unusable device." POR 61. That a Numata plug may permit an earphone to be installed upside down does not render the device "permanently unusable." EX1041, ¶¶20-28. Unremarkably, a POSITA would have flipped the component around with an understanding that known techniques would simplify assembly of the left and right earphones. For example, a POSITA would have recognized that manufacturing errors can be prevented through routine engineering, such as by simple keying or asymmetric geometries design that make reverse insertion impossible. *Id*., ¶21. Furthermore, Patent Owner's related assertion that Numata's plug would become "permanently" stuck because Li's housing lacks Numata's through-hole, *see* POR 66-67, overlooks a POSITA would have understood Numata's through-hole is merely one example of a release mechanism for a snap-fit connection—not a functional requirement of the plug itself—and Li's housing can readily incorporate other standard, releasable locking mechanisms that do not require a through-hole or Numata's release tool. *Id*., ¶¶22-23. The purported risk is neither insurmountable nor sufficient to discourage the

combination, especially given the undisputed benefits of secure fit and wear resistance. *Id*., ¶24.

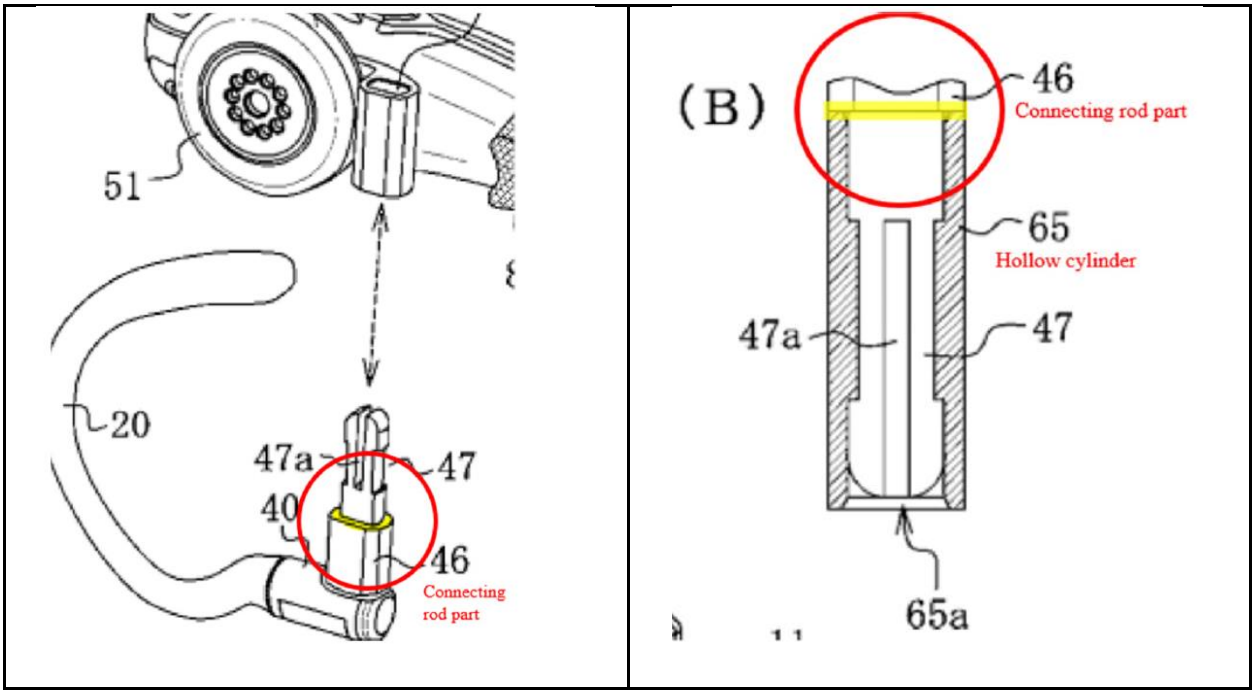
Any possibility of mis-installation is simply a trade-off for achieving the undisputed benefits of the Numata plug end. *Medichem*, 437 F.3d at 1165 ("[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine."). Notwithstanding Patent Owner 's hypothetical concern, a POSITA would have been motivated to combine the teachings of Li-Fujita-Numata given the undisputed benefits of secure fit and improved wear resistance. EX1003, ¶¶199-208; EX1041, ¶¶20-24; *see Uber Techs., Inc. v. X One, Inc.,* 957 F.3d 1334, 1341 (Fed. Cir. 2020) (references need not be physically combinable for prior art teachings as a whole to render claims obvious).

Patent Owner's argument that Numata's plugs do not provide electrical connectivity to Li's housing, POR 67-69, overly restricts the teachings of the references. *Omega Pats., LLC v. BMW of N. Am., LLC*, No. 2022-2012, 2024 WL 227801, at *3 (Fed. Cir. Jan. 22, 2024) (citation omitted). A POSITA would have understood Numata's plugs provide electrical connectivity in multiple ways. EX1041, ¶25; EX1007, ¶¶31-34, FIGS. 8-9.

Patent Owner's reliance on Figure 6 of the '582 patent to assert Numata does not disclose claim 9, POR 69-72, ignores the claim language. Claim 9 requires the

plug end's inserting portion to be "partially inserted*"* into the socket, and the exposed part of the inserting portion to have an annular surface "spaced apart" from the core housing's outer end surface. EX1001, claim 9. Claim 10 depends from claim 9 and adds "when the core housing and the first plug end are fixed." *Clearstream Wastewater*, 206 F.3d at 1446; *Karlin*, 177 F.3d at 971. Figure 6 of the '582 patent is of no help to Patent Owner because it shows the plug end *completely* plugged and fixed within the socket as in claim 10, not *partially inserted* into the socket as in claim 9. EX1001, 12:36-65 (plug end 14 "fixed" to core housing 20 once hooks 143 pass stopping block 23 and elastically restore to be stuck on stopping block 23); EX1041, ¶26.

When the Numata plug is partially inserted into a socket, the yellow highlighted surface of the connecting rod part 46 (i.e., the exposed portion) is arranged in a stepped manner to form an annular table surface that is close to, and spaced apart from, the outer end surface of the hollow cylinder 65 (i.e., the core housing). Pet. 77-79 (citing, e.g., EX1007, Figs. 9 and 8(B) (excerpt) (annotated) (shown below); EX1003, ¶¶219-232); EX1041, ¶27; EX1001, 12:60-65. Even when the Numata plug is fixed to the socket as in FIG. 8(b), a POSITA would have understood that the yellow highlighted surface is "spaced apart" from the outer end surface of the hollow cylinder 65 (i.e., the core housing), e.g., to accommodate typical manufacturing tolerances and permit reliable installation. EX1041, ¶27.



EX1007, FIGS. 9, 8(B)

Patent Owner's argument that Li-Fujita-Numata does not disclose Element 10[b], POR 72-73, fails for the same reasons Patent Owner's arguments relating to Element 1[c] fail. *See* §III.B. Li teaches or suggests a protective sleeve that elastically abuts against the core housing to realize sealing. Pet. 81-83; EX1003, ¶¶236-238. A POSITA would have understood Li's teachings of a protective sleeve interacting with the elastic coating layer 1132 over the core housing to realize even further sealing. EX1041, ¶28.

B. Ground 4: The Li-Liao-Wang-Xu-Nielsen Combination Renders Claims 16-20 Obvious

Patent Owner wrongly argues the Petition lacks "a feature-by-feature showing" of the obviousness of claims 16-19. POR 74-75. Not so: the Petition

explains each element of claims 16-19 is disclosed or suggested by the combination. Pet. 93-107.

Patent Owner relies on a hyper-technical argument regarding the use of Nielsen in the combination against claims 16-19. POR 74-75. In other words, Patent Owner argues that headings should control over evidence and argument presented. The Petition demonstrates claims 16-19 would have been obvious in view of the Li-Liao-Wang-Xu combination and the Li-Liao-Wang-Xu-Nielsen combination.

Claims 17-20 depend from claim 16 and are logically related to each other in that they add additional features related to a magnetic circuit component in the earphone core. EX1001, 38:20-57. The Petition provides ample evidence that a POSITA would have looked to each of Wang, Xu, and Nielsen "to improve the Li-Liao earphone magnetic circuit system with a strong, efficient magnetic field." Pet. 94, 93 ("A POSITA would have found it obvious and been motivated to modify Li-Liao with Wang, Xu, and Nielsen magnetic circuit components and orientations—and to use the Wang, Xu, and Nielsen components and orientations *amongst each other.*" (emphasis added)). The Li-Liao-Wang-Xu-Nielsen combination applied in claim 20 is compatible with the application of the prior art in claims 16-19. Because the Petition explains why claims 16-19 are not patentable, the Board should evaluate the obviousness of these claims as part of

Ground 4. *See Polygroup Ltd. MCO v. Willis Elec. Co.*, 759 F. App'x 934, 942-943 (Fed. Cir. Mar. 28, 2019).

Regarding Patent Owner's Element 16[a] arguments, POR 75-78, the Petition identifies other portions of Liao that disclose a magnetic circuit component generating a first magnetic field. *See* Pet. 93 (citing EX1005, [0052], [0053], [0143], [0145], [0148]-[0152], [0171], Figs. 11, 18-A, 18-B, 22-A). The magnetic circuit system speaker art is predictable and is known to have component interchangeability. EX1003, ¶264. A POSA would have understood Liao to disclose or suggest a suitable magnetic circuit component in a housing using a direct connection technique. EX1041, ¶¶29-31.

Patent Owner also overlooks the Petition relies upon each of Wang and Xu as disclosing Element 16[a]. Pet. 95-96 (citing EX1003, ¶¶268-270); EX1008, ¶18, FIGS. 1, 3; EX1009, ¶ 26, FIGS. 1, 2. The application of Wang and Xu to Element 16[a] is consistent with the Petition's application of these references to the remainder of claim 16's *magnetic circuit system* features. *See* Pet. 96-100.

V. CONCLUSION

Petitioner respectfully requests that all Challenged Claims be found unpatentable and canceled.

Respectfully submitted,

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CERTIFICATE OF WORD COUNT COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I hereby certify that this Reply complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i). As calculated by the word count feature of the word-processing system used to prepare this Reply, it contains 5,579 words, excluding the parts of this Reply that are exempted by 37 C.F.R. § 42.24(a) (including a table of contents, a table of authorities, mandatory notices under 37 C.F.R. § 42.8, a certificate of service or word count, and appendix of exhibits or claim listing).

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CERTIFICATE OF SERVICE

I hereby certify that, on May 18, 2026, a true and correct copy of this Petitioner's Reply to Patent Owner's Response, including all exhibits thereto, was served via electronic mail upon the following email address(es):

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